ERP IN THE AEROSPACE AND DEFENSE INDUSTRY

OVERVIEW OF THE INDUSTRY IN MID 2000

Presented to the Government ERP Conference
New Orleans, LA
September 12, 2000

Thomas E. Shaw ***Alexander Lengyel***
Engineering and Manufacturing Management Consultants

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- Some Major ERP Implementation and Architectural Issues
- Example of Rapid Implementation
- The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommendations

ENTERPRISE RESOURCES PLANNING (ERP) DEFINITION

A method for the effective planning and controlling of ALL these sources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company.

Includes:

- **Typical MRP II Functions**
- **Sales Force Automation**
- **Engineering Functions/PDM Functions**
- **Advanced Manufacturing Function**
- **Distribution/Logistics Functions**

Quality Functions
Field Service Functions
Complete Financial
Human Resources Functions
Management Reporting

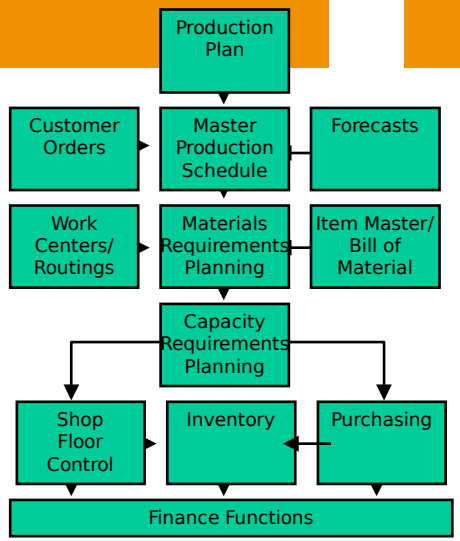
ERP is a System for the Entire Company - A Global Tightly Integrated Closed-Loop System

Source:APICS Complex Industries Special Interest Group

Organization Chart vs. MRP II

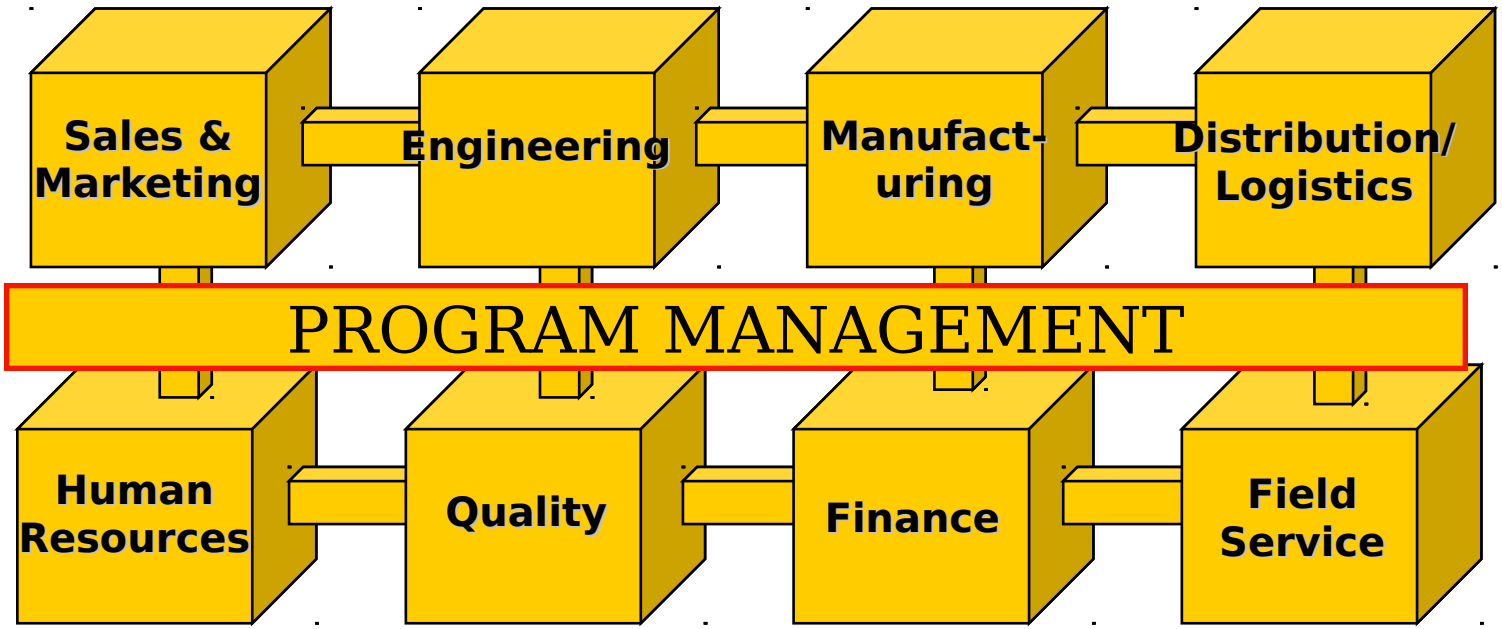
CEO

Sales & Marketing	**Human Resources**	**Engineering**	**Quality**
Manufacturing	**Finance**	**Distribution**	**Field Service**



Source:APICS Complex Industries Special Interest Group

Typical ERP Functionality



Source:APICS Complex Industries Special Interest Gr

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- Some Major ERP Implementation and Architectural Issu
- Example of Rapid Implementation
- The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommendatio

ERP IN THE AEROSPACEAND DEFENSE INDUSTRY

EVERYBODY IS DOING IT OR TALKING ABOUT DOING IT, BUT THERE IS CONSIDERSABLE DIVERSITY: IT IS A MIXED BAG

AT ONE END OF THE SPECTRUM, MAJOR GO-LIVES: IN THE LAST TWELVE TO EIGHTEEN MONTHS HAVE VALIDATED CURRENTLY AVAILABLE SOLUTIONS ACROSS THE WORLD: SOME RESOUNDING SUCCESSES : “BIG BANG”, MOST LEGACY SYSTEMS DISCONNECTED; RAPID IMPLEMENTATION;

- AT THE OTHER END PLODDING EFFORTS: START PROJECT(S), STUDY, ASSEMBLE TEAMS, BUT,ORGANIZATION CHANGES, CULTURAL AND POLITICAL CONSIDERATIONS AND AFFORDABILITY ISSUES DELAY THE PROJECTS.

- BENEFITS ARE BEING OBTAINED, QUANTITATIVE DATA STILL SCARCE

- THERE IS CONSIDERALE EMPHASIS ON PROVIDING SOLUTIONS FOR AIRLINE OPERATIONS AND DEFENSE LOGISTICS AND SOME SOFTWARE PROVIDERS ARE WORKING TOWARDS BECOMING THE “SUPPLIER OF CHOICE” FOR A COMPREHENSIVE INDUSTRY SOLUTION

- MMAS, EVMS AND GOVERNMENT ACCOUNTING REQUIREMENTS CAN BE MET BY MODERNSOF SOFTWARE PRODUCTS

- ***CONFIGURATION MANAGEMENT STILL POSES CHALLENGES***

- PDM SOLUTIONS STILL TEND TO BE POINT SOLUTIONS

- THE ADVENT OF THE INTERNET IS ENABLING INTEROPERABILITY AND - FINALLY - MAKING THE AUTOMATION OF SUPPLY CHAIN MANAGEMENT POSSIBLE

Key Observation

CULTURAL AND ORGANIZATIONAL ISSUES AND THE PULL OF LEGACY SYSTEMS ARE STILL VERY STRONG INFLUENCES

Three factors affect what an organization can do:

- **Its resources;**
- **Its processes**
- **Its values**

Reference:
"Meeting the Challenge of Disruptive Change"
Harvard Business Review
Reprint No. R00202
March-April 2000

THE MOST EXCITING DEVELOPMENTS IN THE INDUSTRY ARE INTERNET BASED

- THE ADVENT OF THE INTERNET IS ENABLING INTEROPERABILITY AND FINALLY MAKING THE AUTOMATION OF SUPPLY CHAIN MANAGEMENT POSSIBLE.

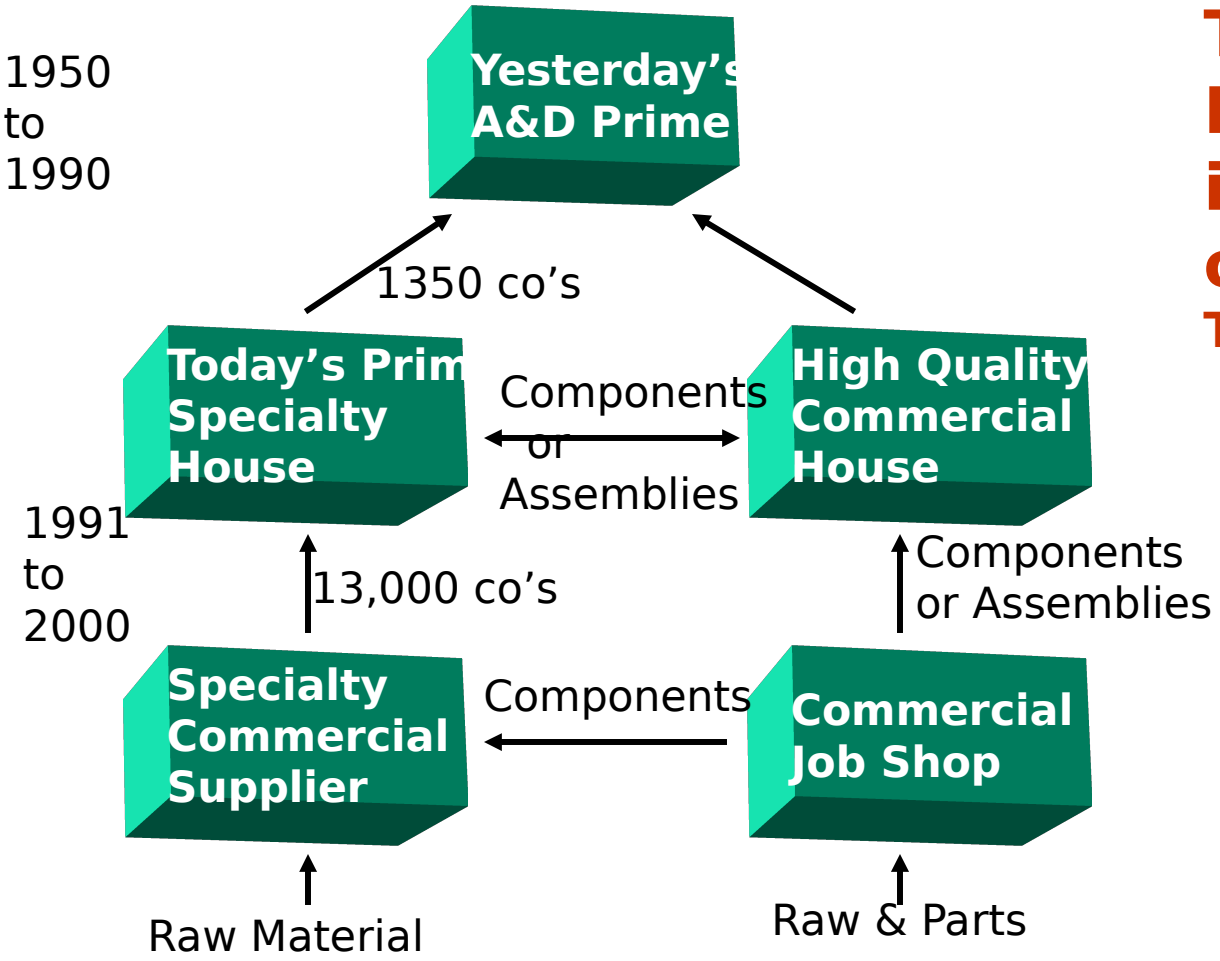
- THE INTERNET EXCHANGE WILL PROVIDE A NEW LEVEL AND PRO-COMPETITIVE ENVIRONMENT FOR AEROSPACE AND DEFENSE SUPPLIERS AND BUYERS OF ALL SIZES AROUND THE WORLD.

- CAUTION: SOLID BACKBONE SYSTEMS ARE NEEDED MORE THAN EVER AND DATA ACCURACY IS MORE IMPORTANT THAN EVERE!

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- Some Major ERP Implementation and Architectural Iss
- Example of Rapid Implementation
- The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommendati

Complex, Highly Engineered Products

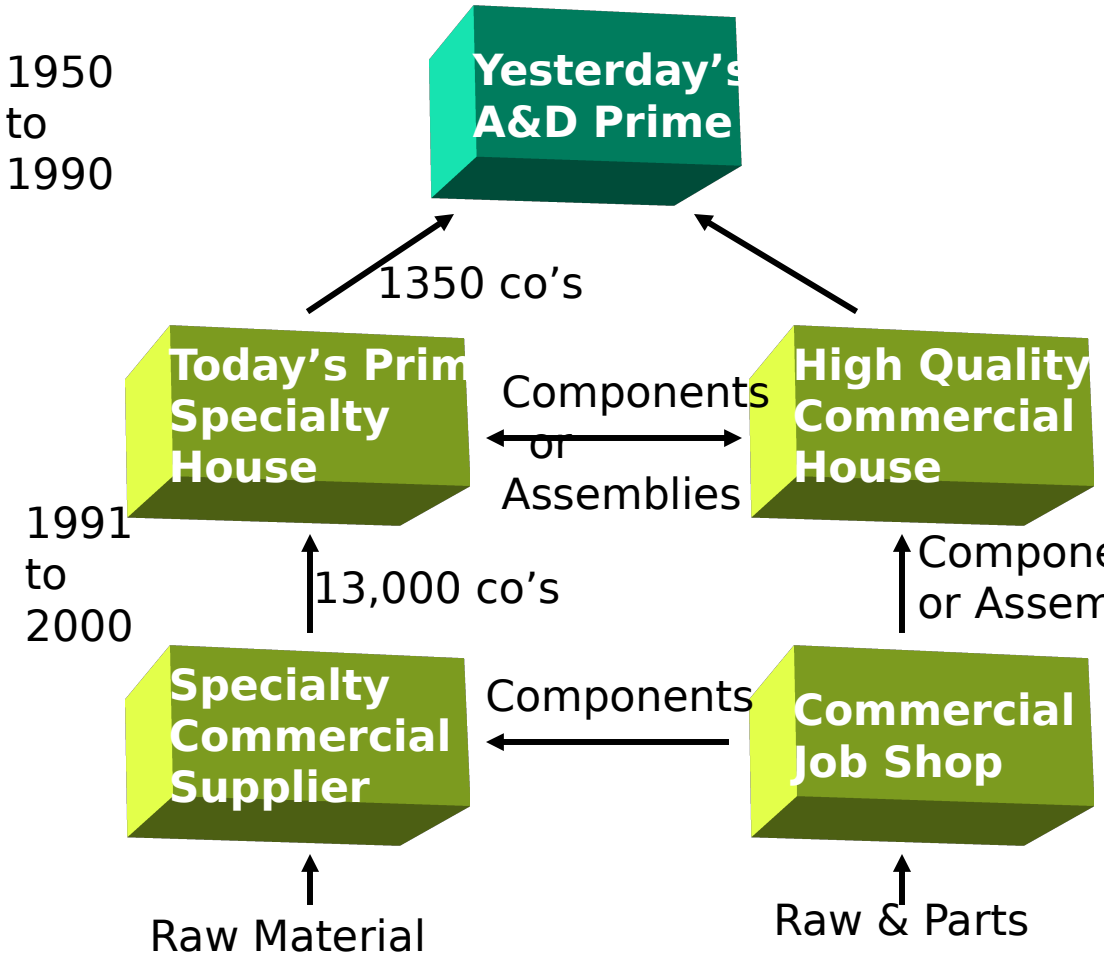


The Aerospace & Defense Industry is Still in a Proces of Change . . .

Trends; 1950 to Presen

Courtesy of Plant-Wide Resea

Complex, Highly Engineered Products

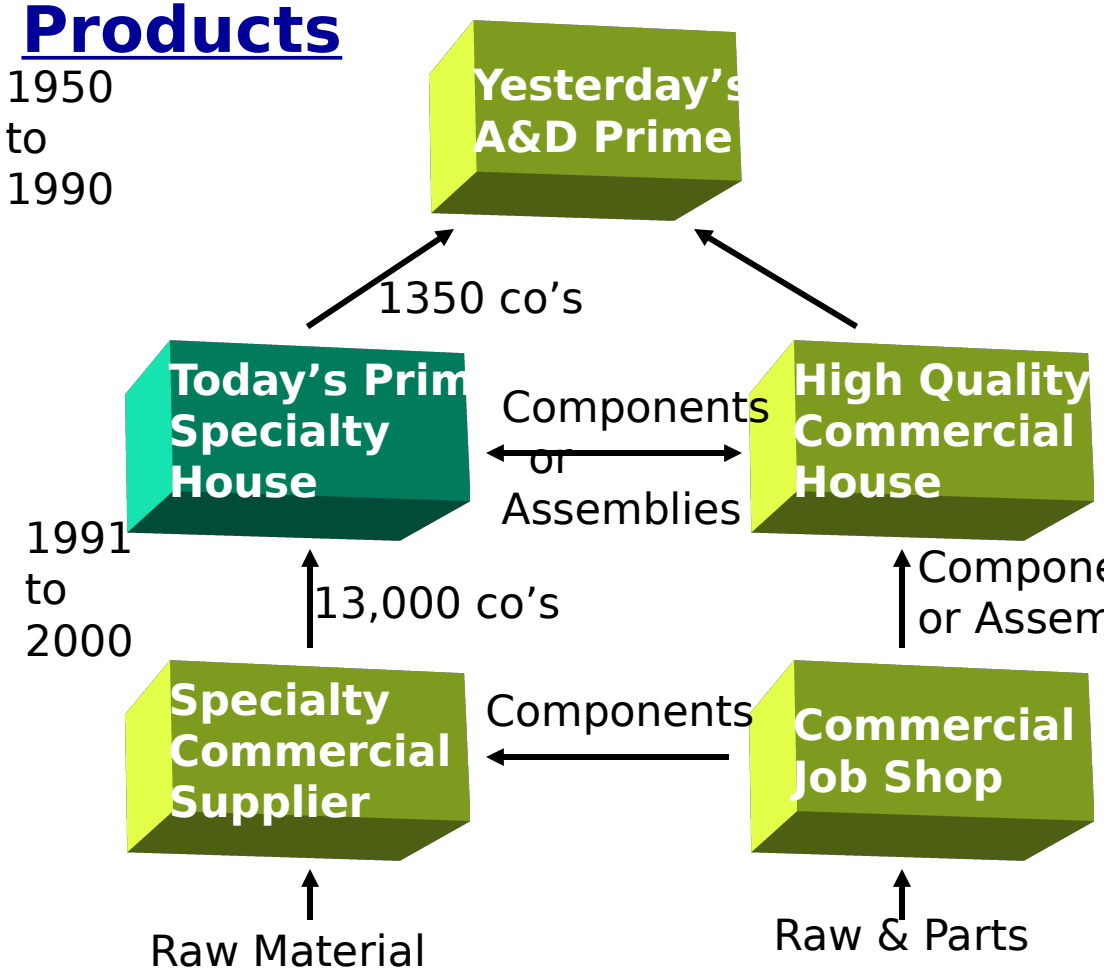


Yesterday's A&D Prime; 1950 to 1990

- Entire product delivered and manufactured
- Configuration Management is a major issue
- ERP must be MMAS compliant
- Pay as you go contracts
- Hierarchical organization
- 3300 major players in 1990
- R& D oriented
- 320 major players in 1998
- Now, fixed-price

Courtesy of Plant-Wide Research

Complex, Highly Engineered Products

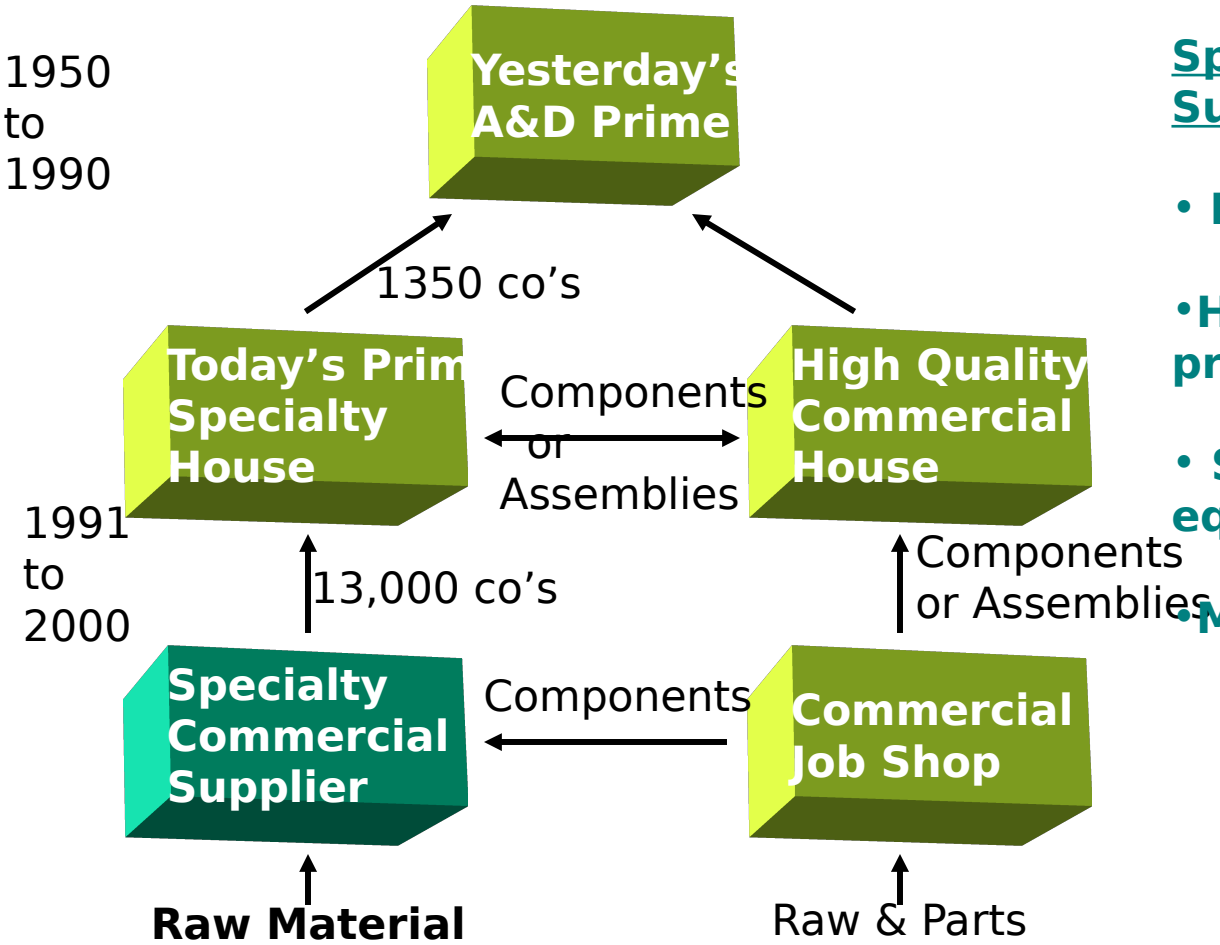


Prime Specialty House

- Supports MMAS
- Configuration Management is a major issue
- Does some commercial work
- Out-sources production to specialty commercial suppliers
- R&D oriented
- Highly qualified engineering personnel
- May be lean and agile

Courtesy of Plant-Wide Research

Complex, Highly Engineered Products

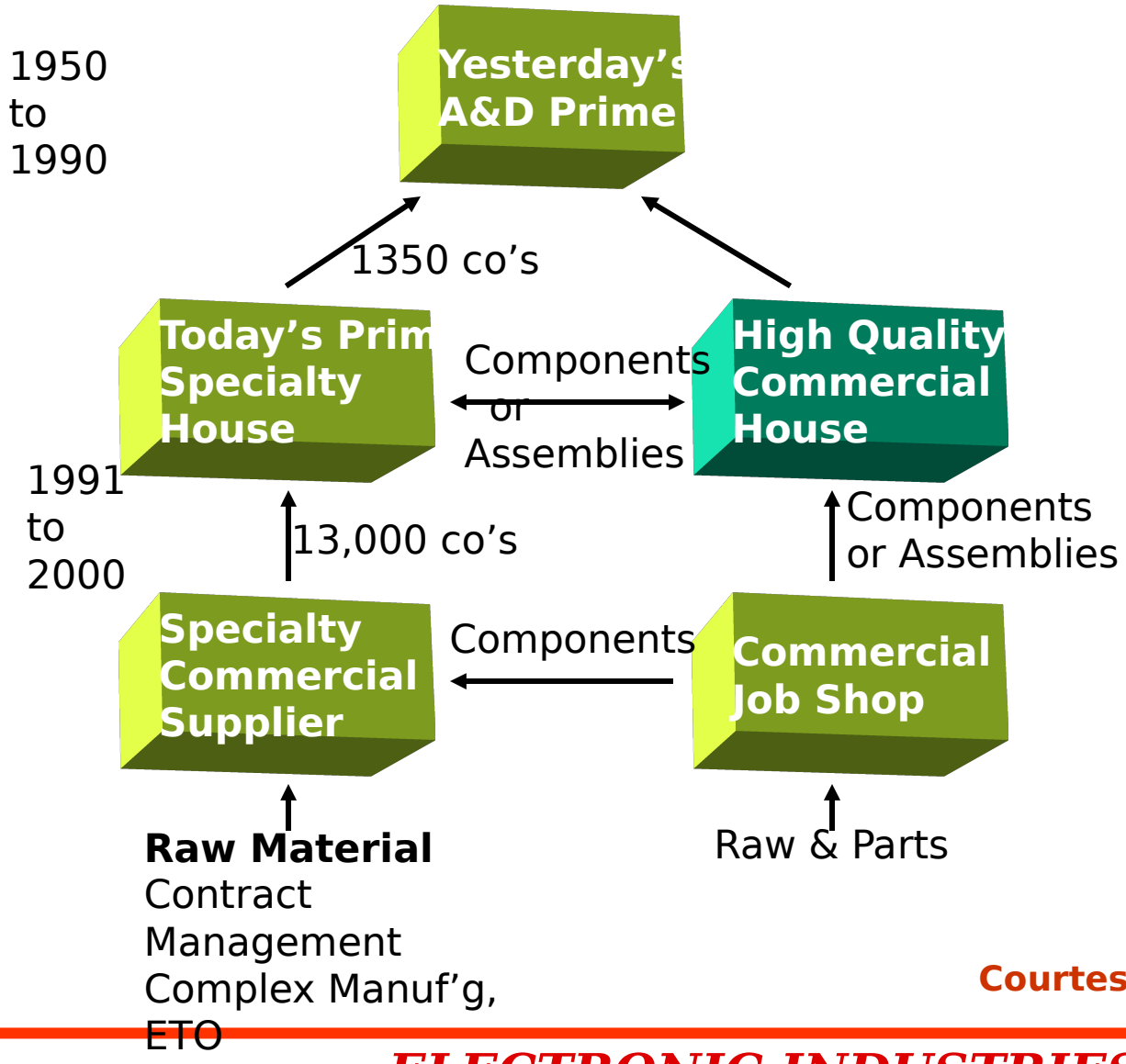


Specialty Commercial Supplier

- **Engineering driven**
- **High quality production**
- **Specialized equipment**
- **May be lean and agile**

Courtesy of Plant-Wide Research

Complex, Highly Engineered Products



High Quality Commercial House; 1994 to 2000

- **Profit Oriented**
- **Strong engineering capability**
- **Not MMAS Compliant**
- **Commercial House**
- **May be lean and agile**

Courtesy of Plant-Wide Research

Complex, Highly Engineered Products

Commercial Job Shop

- **Profit Oriented**
- **High quality**
- **Commercial production**
- **May be lean and agilegile**

Courtesy of Plant-Wide Researc

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- Some Major ERP Implementation and Architectural Issues
- Example of Rapid Implementation
- The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommendations

BROAD REVIEW OF SOME PROGRAMS

- **SAP in Aerospace and Defense**
  - **MOST A&D OEMs HAVE SELECTED SAP (NOTABLE EXCEPTIONS: BOEING AND GE ENGINES**
  - **PRESENTED SEPARATELY**
- **Oracle Implementations:**
  - **GE Corporate ERP Strategy**
  - **GE Aircraft Engine ERP**
- **Vendor Characterization**

GE Aircraft Engines

- **Launch Customer: GE Engine Services - 30+ sites globally**
- **Complete ERP partner - Financials, Mfg, SCM, Distribution, MRO**
- **Address customer-unique business processes (e.g. UAL vs. Delta) & gov't regulatory req'ts (e.g. FAA, DoD)**
- **Track raw materials from source through repair process (e.g. titanium)**
- **Monitor/document stringent training & certification req'ts & personnel engaged in activities**

Chart Courtesy of Oracle Corporation

MRO (Maintenance, Repair & Overhaul)

RADM Heilman, MRO '99
Keynote speech on weapon system product support

- **Driving change** **Affordable weapon system from a life cycle view**
- **Key Enabler** **Information technology - New paradigm**
- **Strategy** **Increased reliance in the private sector**
- **Concern** **No metrics for enterprise optimization**

Chart Courtesy of Oracle Corporation

Oracle MRO Value Proposition

- **Inventory Reduction > 20%**
  - Configuration Managed Decisions
  - Part Alternativity and Availability
- **Turn-Time Reduction > 25%**
  - Real-time Part Ordering & Rapid Routing
  - Auto Shop Scheduling & Production Balancing
  - Provides Increased Capacity
  - Allows for higher pricing
- **Predictable Turn-Times < 10%**
  - Configuration Generated Plans
  - Accurate and Planned Part Availability
- **Other**
  - Reduced errors
  - Enforces process compliance
  - Saved documentation and storage costs
  - Co-developed with Industry, focused on ROI vs. feature

Chart Courtesy of Oracle Corpo

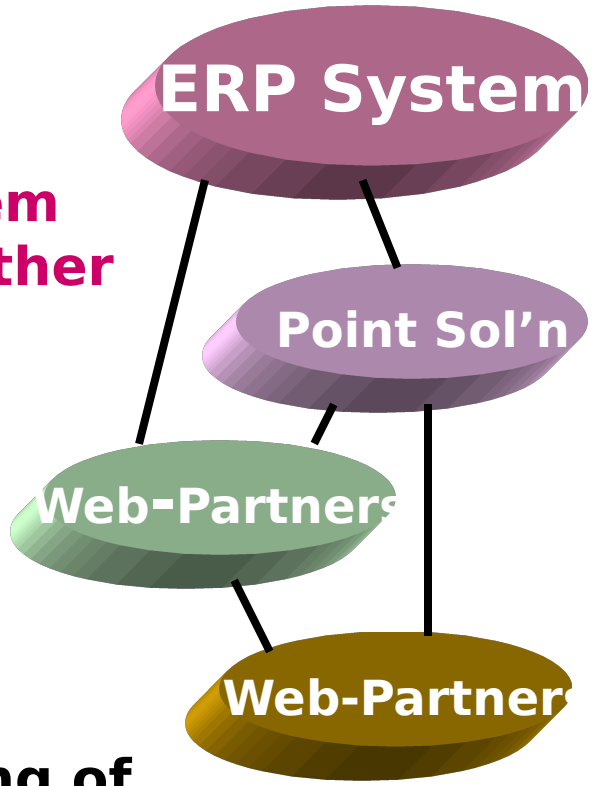
ERP Systems: Today & Trends

All for one, one for all!

Where does one system end? Where does another begin?
Who owns or controls what?

Security is both easy & complex to manage.

The **openness & sharing of information** changes the definition of “security.”



- **Internal & external entities need password access to specific areas**
- **Information passed on the Internet can be subject to drag & drop sharing**
- **Private & Public Documents, Sieban links and encoding can be used to control the passing or access of information**

Courtesy of Plant-Wide Research

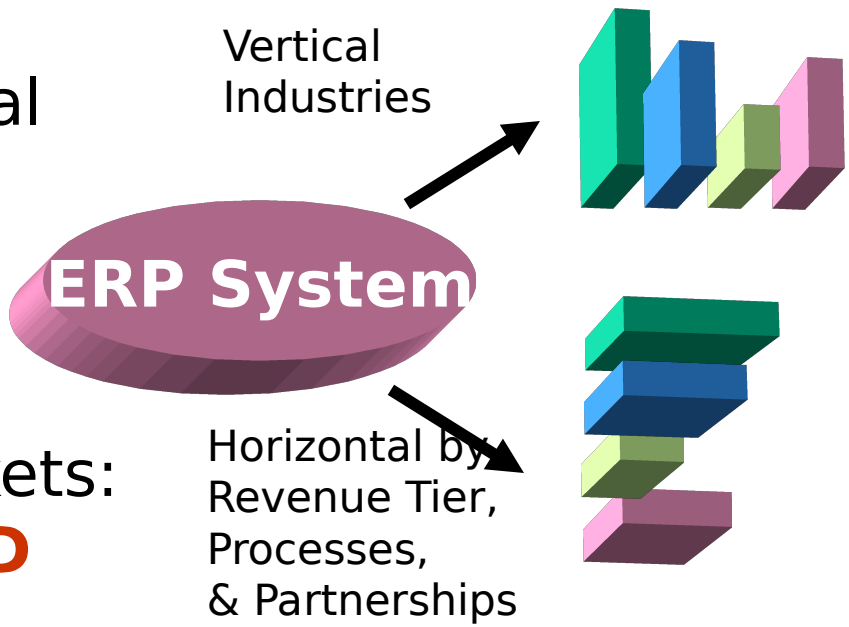
Where are the protections

ERP Systems: Today & Trends(Continued)

Specialization
by vertical & horizontal categories

Vendors seek to gain growth and increased share of specific markets:
WDS, Cincom = A&D
Baan, Glovia = ETO

Only the top-tier vendors can "specialize" in all or most markets
SAP, Oracle



Courtesy of Plant-Wide Research

ERP Systems: Today & Trends(Continued)

Tiers Of Markets

that each vendor serves

Vendors, by virtue of the many system modules and the number of clients, can better serve specific market segments

Vendor revenues, number of consultants, and scope of product

Type of ERP System better serve	Markets they
Top-Tier ERP System	Global, Multi-Plant with $2 Billion/+ in revenues & Diverse Operations
Upper-Tier ERP System	-- Scalable to mid-sized Multi-Plant Enterprise with specialized needs, complex products
Mid-Tier ERP System	Commercial Enterprise with special focus
Lower-Tier ERP System	Single Site within an Enterprise

plants, $50M+ revenue

Courtesy of Plant-Wide Research

ERP Systems: Today & Trends (Continued)

Interoperability

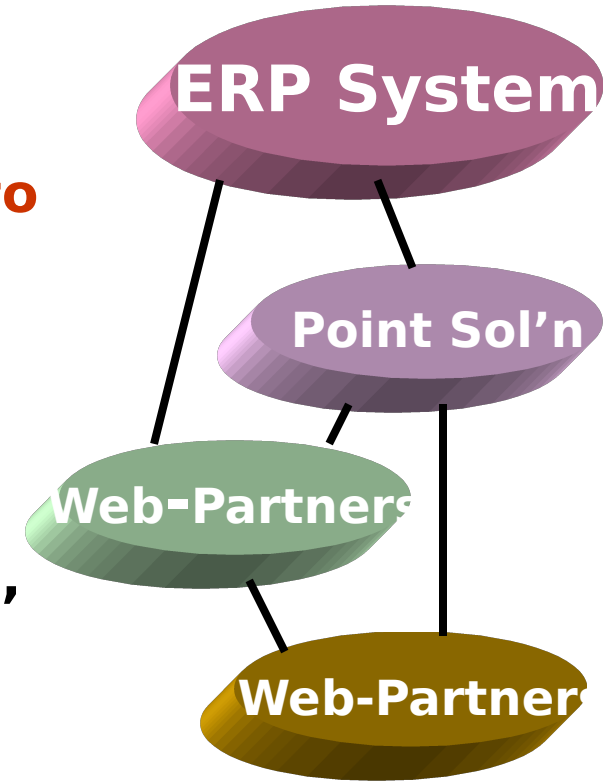
(better than supercalifragilisticexpialidocous)

This is the Major New Achieveme

Interoperability has required a full decade to achieve

Today's enterprise consists of many operational sites -- call centers, manufacturing, design, distribution, financial, research, information technology and business sites

The extended enterprise has to, and does, include



- **Diverse systems have to communicate and collaborate**
- **The Internet, Portals, Workflow Processes, datamarts, technology and system design all serve "interoperability**
- **General and special Supply Chains can be achieved to enhance partner's**

Courtesy of Plant-Wide Research

ERP Systems: Today & Trends (Continued)

Complex, Highly Engineered Products

Who Best Serves This Market?

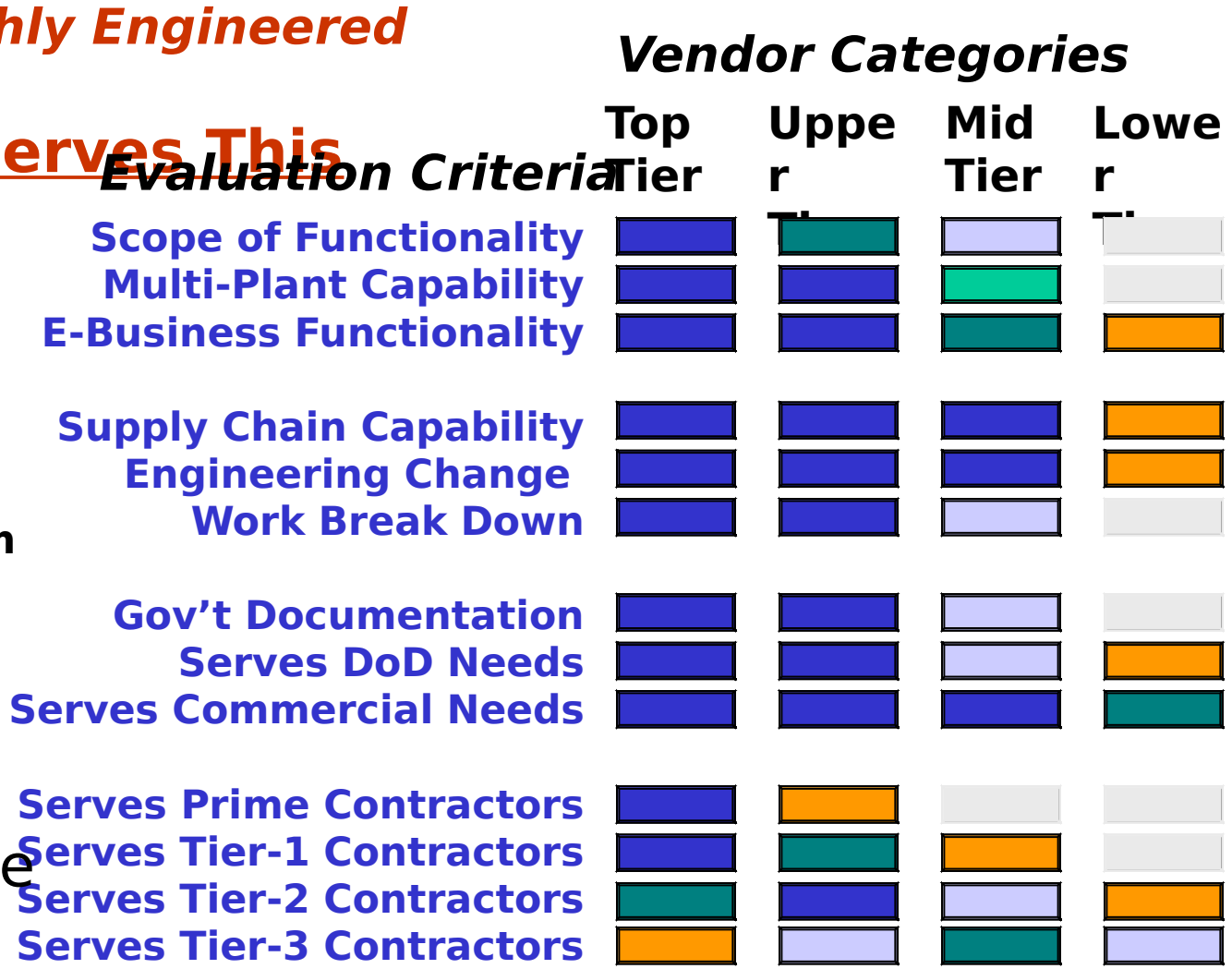
Example Vendors

Top Tier: SAP, Oracle

Upper Tier: Baan, WDS

Mid Tier: Cincom, Glovia

Lower Tier: Visibility, CIMA



ERP Systems: Today & Trends (Continued)

Who Best Serves This Market?

Prime & Tier One Contractors Require:

- Global, multi-plant capability with strong Engineering, Procurement & Inventory Control functionality

There are only a few ERP vendors who can serve this category

Tier Two Contractors Require:

- Multi-plant & E-Business capability with strong Engineering, Procurement, Inventory & Scheduling functionality

Only a quarter of the top 50 vendors can serve this category

Tier Three Contractors Require:

- E-Business, Engineering, Inventory & Scheduling functionality

Half of top 50 vendors can serve this category

Plant-Wide Research

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- → Some Major ERP Implementation and Architectural Iss
  - Integrated vs. Best of Breed
  - The Legacy Systems
  - ERP/PDM Relationship
- Example of Rapid Implementation
- The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommendati

Integrated vs. Best of Breed

Integrated vs. Best of Breed

Ferrari Dealership

2000 Ferrari Roadster

385hp Engine
Tiptronic Transmission
Multi Link Transaxle
Motronic Fuel Injection
Ferrari Designed Pirelli Tires
(all components specifically designed to Ferrari specifications)

Big Al's Auto Nirvana

2000 *Best of Breed* Ferrari Roadst

Corvette 5.0 Liter Engine
BMW M3 Transmission
Porsche Transaxle
Maserati Fuel Injection System
Mercedes Designed Michelin Tire

Interfaces and Problem Resolution ??

- ***One Call to your local Ferrari Service Mgr***
- ***You are Covered by a Single Warranty***

- ***Do you call the Service Mgr from…..***
  Corvette, BMW, Porsche, Maserati or Mercedes ??

The Legacy Systems

LEGACY SYSTEMS

- THE ORGANIZATION IS USED TO THE LEGACY SYSTEMS
- THE LEGACY SYSTEMS EMBODY THE PRESENT CULTURE
- THE LEGACY SYSTEMS OFTEN PROVIDE POINT OPTIMIZATION
- NOT ALL LEGACY SYSTEMS DESERVE RETIREMENT
- INTERFACES BETWEEN LEGACY SYSTEMS AND THE NEW SYSTEMS ARE MOSTLY COMPLEX, TIME CONSUMING TO BUILD AND CHECK AND EXPENSIVE
- BEFORE IMPLEMENTING A NEW ERP SYSTEMS THE COMPANY MUST MAKE SURE IT UNDERSTANDS ITS PROCESSES AS WELL AS THOSE ENCODED IN THE NEW SYSTEM
- KEEPING LEGACY SYSTEMS MAY MEAN KEEPING BAD OLD HABITS
- THE NEW SYSTEMS MAY ONLY PROVIDE “80% FUNCTIONALITY” - SOME, LIKE RAYTHEON AIRCRAFT, HAVE SHOWN THAT THIS IS GOOD ENOUGH, IF ONE GETS INTEGRATION AND PROCESS STREAMLINING WITH THE NEW SYSTEM

  BEFORE PROCEEDING THIS MUST BE A VERY SERIOUS TRADE-OFF

Reference: Don Frank in the APICS Advantage of July 2000

ERP/PDM Relationship

ERP/PDM Relationship

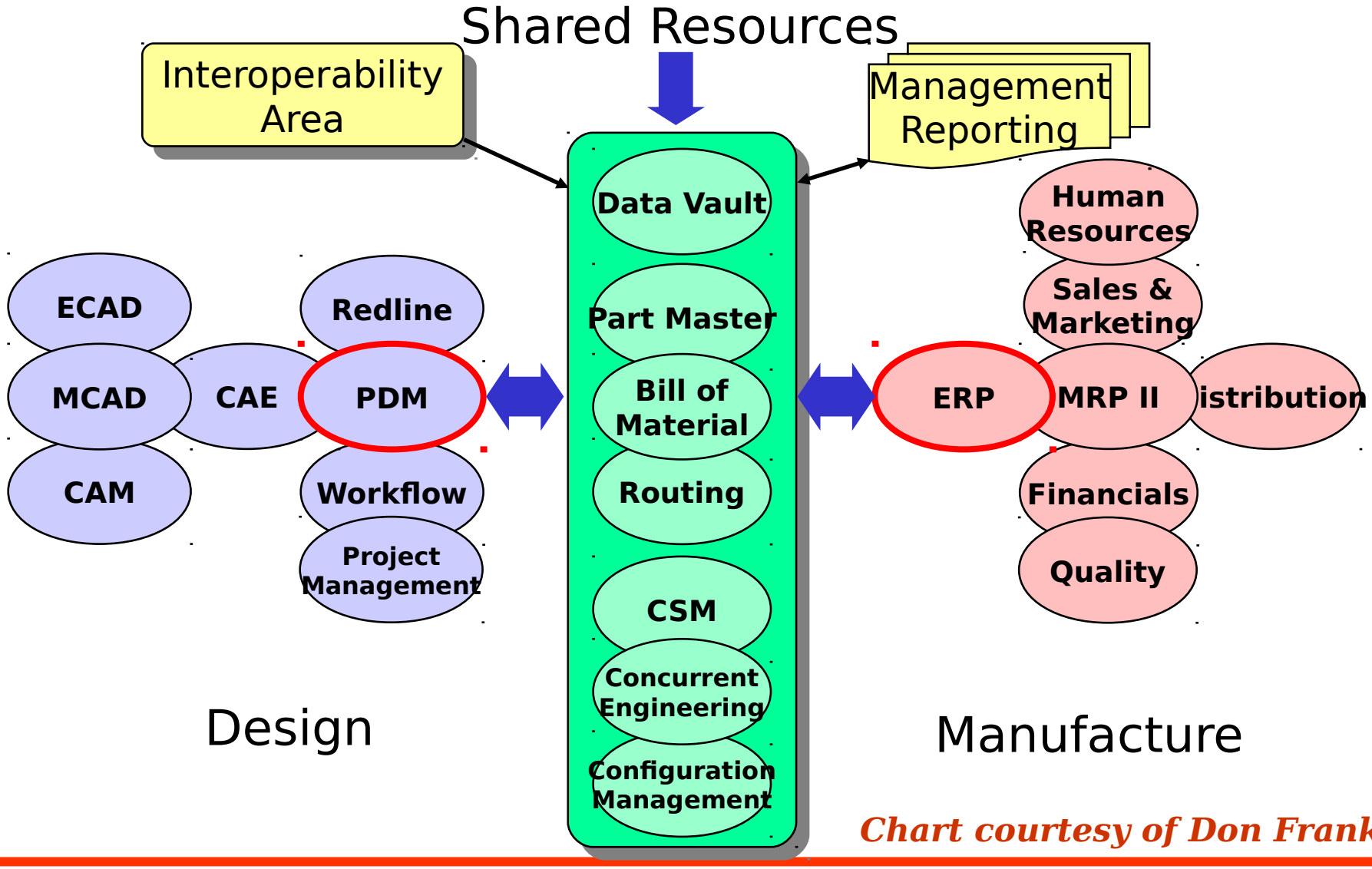
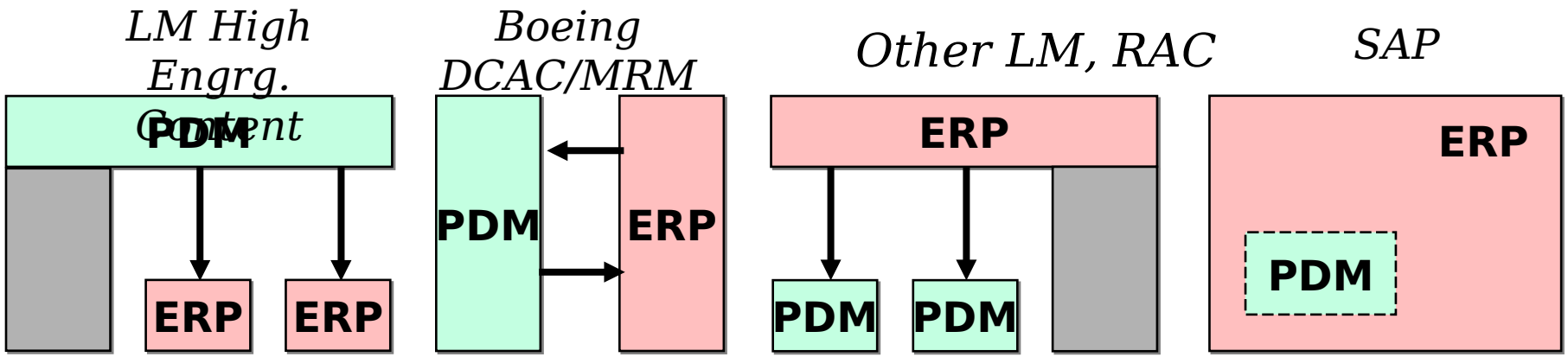


Chart courtesy of Don Frank A

PDM-ERP WILL DICTATE THE INDUSTRY'S FUTURE FOR DEVELOPMENT AND MANUFACTURING INTEGRATION AND INTEROPERABILITY

- "SINGLE SYSTEM" VERSUS "INTEGRATED SYSTEMS" SOLUTION
- EXAMPLES OF EACH MODEL ARE SUCCESSFULLY USED
- MANY ISSUES IMPACT APPROPRIATE DECISION
  - SCOPE, FOCUS, OBJECTIVE, BUSINESS, INTEROPERABILITY



MAJOR PDM-ERP INTEGRATION INITIATIVES

- BOEING COMMERCIAL AIRCRAFT CO. DCAC (DESIGN CONTROL OF AIRCRAFT CONFIGURATION) MRM - METAPHASE (PDM), WESTERN DATA, BAAN ERP SYSTEMS
  - SINGLE BOM OBJECTIVE
  - EFFECTIVITY CONTROL VIA EBOM

- RAYTHEON AIRCRAFT CO. - INTEGRATED PRODUCT/PROCESS TECHNICAL DATA PACKAGE
  - TECHNICAL DATA ENTITY
  - IBM PRODUCT MANAGER (PDM), SAP ERP SYSTEM
  - KEY ISSUE: STANDALONE PDM OR INTEGRATED VIA ERP

- LOCKHEED MARTIN COMPANY
  - ERP IMPLEMENTATION UNDERWAY IN SOME ORGANIZATIONS

- OMG – OBJECT MANAGEMENT GROUP PDM REQUIREMENTS FOR CORBA COMPLIANT SYSTEM (INCLUDING ERP INTERFACES)

"AN INDUSTRY GOLD STANDARD"

EXAMPLE OF RAPID IMPLEMENTATION

RAYTHEON AIRCRAFT*
WICHITA, KANSAS

*Charts Courtesy of John Ferney, Raytheon Aircraft

How They Started

- Raytheon selected SAP as Corporate ERP standard
- Raytheon Aircraft committed key people to develop recurring benefits – commitments made and added to operating budgets
- Summer of 1997 visited live aerospace and defense sites
  - Westland Helicopters - UK
  - AVRO/BAe - UK
  - General Electric - Cardiff, Wales
- Prepared program plan
- Completed a phase zero - proof of concept and

Chart Courtesy of John Ferney, Raytheon Air

Team Raytheon Partner

- Approac
- Synergy International Con
  - Core R/3 integration
  - R/3 web enable

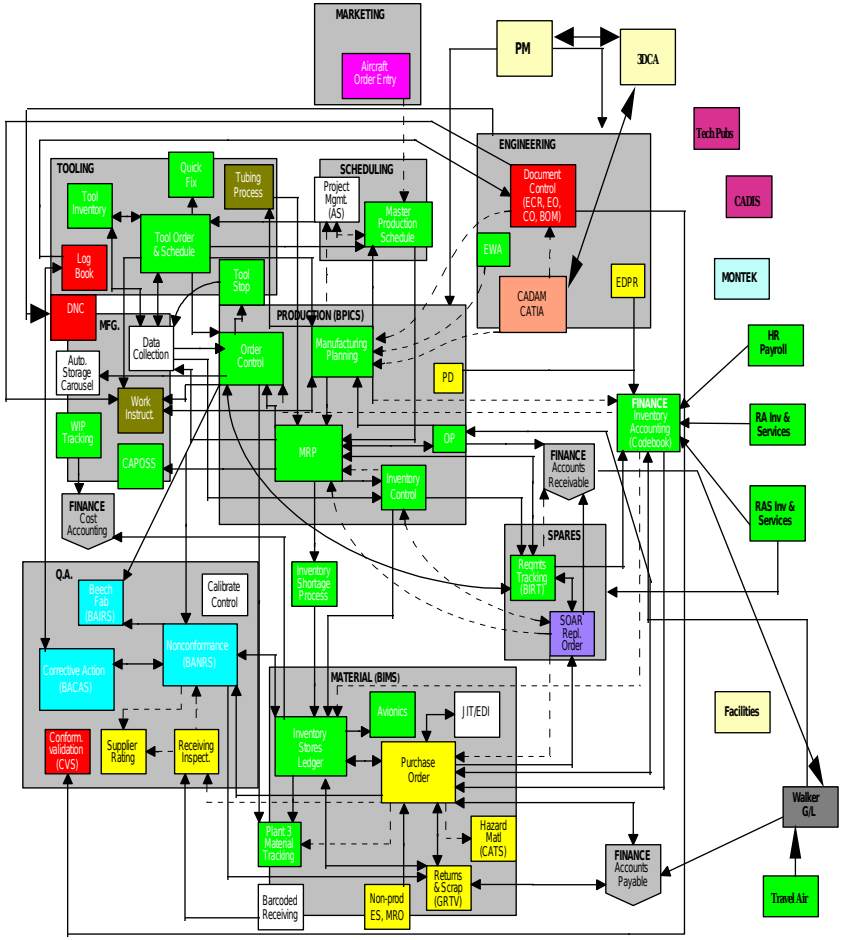
In alliance with DRUID

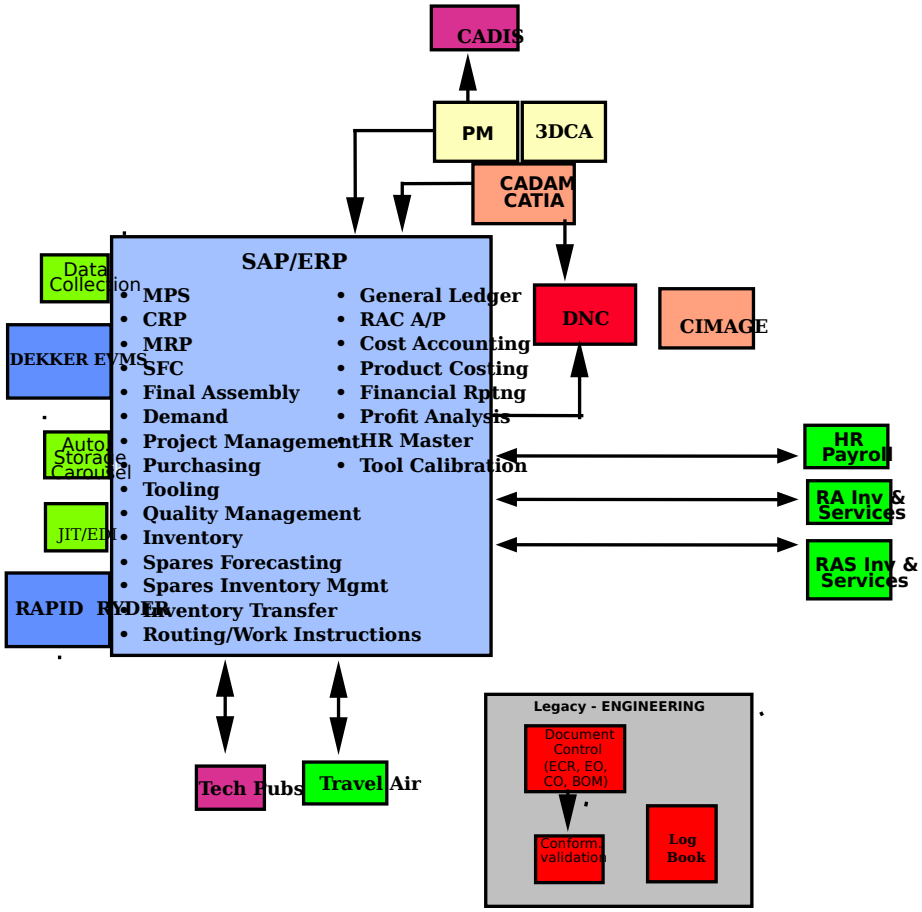
- Hardware
  - R/3 UNIX - SUN Clus

  - Web

Windows NT
scalability availability manageability

Chart Courtesy of John Ferney, Raytheon Ai





"As - Is" (as - was) Condition at RAC

End State - ERP

Chart Courtesy of John Ferney, Raytheon A

Objectives

- Replace thirty year old non-integrated systems
- Obtain benefits of business process reengineering
- Use ERP to drive RAC integration
- Become a proactive organization
- Facilitate Achievement of Raytheon Aircraft Company - five year plan

Chart Courtesy of John Ferney, Raytheon Airc

Program Ground Rules

- Off the shelf software - no modifications
- Maximize use of pre-configured_processes within SAP
- Leverage work completed by E-Systems
- Collocation of Team
- Projects redirected and tied to ERP
- Only case by case emergency changes to existing systems
- Extensive training and education
- Focus on cultural change
- Milestone driven using EVMS techniques

Chart Courtesy of John Ferney, Raytheon A

The Solution

- 16 month main go-live implementation program
- Big bang activation with all SAP modules - January 3, 2000
- Only five legacy interfaces
- 2400 average daily concurrent users – week one
- 4,500,000 dialog steps daily average
- iXOS document imaging for AP
- Vertex for sales and use tax
- JetForm for printed documents
- ITS based Web enablement

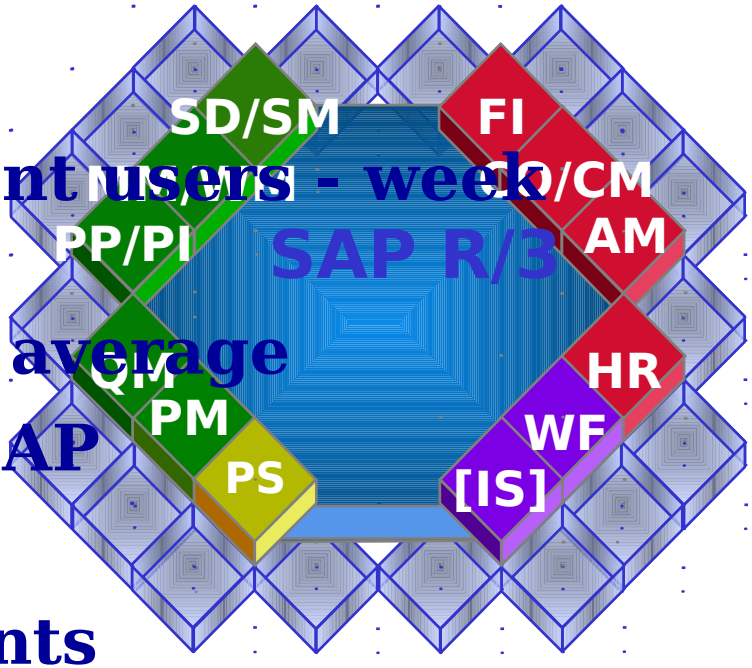


Chart Courtesy of John Ferney, Raytheon A

ERP: Processes, Not Technical

- Legacy systems (MRP) were primarily Information Technology projects focused on automation of existing processes
- ERP is a vehicle to facilitate process redesign
  - ERP is not an I.T. project, it is a business process project
    - 15% I.T.
    - 25% Software, Hardware
    - 60% Users (People and Processes)

Business event, not technical

Chart Courtesy of John Ferney, Raytheon Aircr

Program Ownership

- Raytheon led project management office
  focused on solution and change management
- Full time business manager, EVMS managed
- Used ASAP templates
- Integrator (Synergy) had prior Aerospace
  implementation experience

Chart Courtesy of John Ferney, Raytheon Airc

Project Team

Program was led by business process owners

- **Transferred into new ERP department/cost center**
- **Full time (plus!)**
- **Co-located**
- **No offices, all levels**
- **Trained**
- **Configuration done by process owners**

Chart Courtesy of John Ferney, Raytheon Airc

Team Structure

Aligned team by business processes

- **Eight process teams**
- **Each team worked multiple modules**
- **Forced cross training**
- **Mixed team seating to promote communication**
- **Team structure drove integration**
- **Did not effectively integrate ABAP staff with teams**

Chart Courtesy of John Ferney, Raytheon Airc

Schedule

Aggressive 16 month schedule

- **Big bang**
- **Early scope definition**
- **Early exit out of realization phase**

allowed 6 months for end to end testing

- **Lowered overall cost ($58M vs +$100M)**
- **Allowed early benefits realization**
- **Assured momentum**
- **Ke**

More time would not have helped….

Chart Courtesy of John Ferney, Raytheon A

Roll Out

BIG BANG !

- 2,400 concurrent users on day one
- Reduced overall program schedule and cost
- Eliminates need/expense for temporary interf
- Integrated solution centered around SAP proc
- Go-live “pain” over in one go
- Executed an “early go-live” for team “practice
- Focused business on the new way ….

Chart Courtesy of John Ferney, Raytheon A

Process Re-engineering

Used best practices built into SAP

- **SAP processes offer flexibility**
- **SAP allows for continuous improvement after g**
  Active 6 sigma program in place
- **Limit R/3 modifications**
- **80% solution (some folks give for the good of t**

Chart Courtesy of John Ferney, Raytheon Airc

Change Management

- Key process owners “own” solution
- Engaged senior management steering comm
- Solid CEO support
- Process demos: mini Sapphire at end of reali
- Extensive communication
- Continuing education

Chart Courtesy of John Ferney, Raytheon Aircra

Data Conversion

They got this one wrong

- Needed to do more clean-up and conversion within SAP

- Ownership for data clean-up and mapping

- Under estimated the impact of integration

Chart Courtesy of John Ferney, Raytheon Aircr

R/3 Training

Process education

- Process training rather than transaction training

Not sure this was the best approach

- Invested in education (e.g. APICS)
- Ensure the right people are in the new roles
- Extensive post go live training

Chart Courtesy of John Ferney, Raytheon Aircr

"Go-live"

"Go-live is painful !"

- **Activation support team**
- **Power users and consultants on floor**
- **Highly responsive HELP desk**
- **Developed and measured health metrics**

Meet daily with steering committee and weekly with CEO

- **Tiger teams to key issue areas**
- **Data was root of most problems**
- **Solution was solid**

Chart Courtesy of John Ferney, Raytheon Airc

Integrated Solution

The RAC solution was all SAP

- Five interfaces (payroll, PDC, PM, carousel, Eng. doc)

- All SAP modules and business processes (excl. payroll)

- Modified processes to fit those in SAP

- Achieved high degree of integration

- Forced master data issue to the forefront quickly

- Warranty end to end process developed with key ABAP and Web (ITS)

Chart Courtesy of John Ferney, Raytheon A

Major ERP Driven Changes

- Make to stock fabrication facilities - two month cycle time reduction
- Eliminated thousands of weekly WIP transfers
- Integrated RAPID with the factory
- Forecasting of spare parts integrated
- Standard cost solution replaces prior actual cost system
- Assembly lines “pull” materials using networks
- Sales use variant configurator to specify and communicate aircraft configuration (reduced up to 3 months of cycle time)
- Web: time cards, travel, expenses, customer order entry

Chart Courtesy of John Ferney, Raytheon Aircr

Issues

- Data Collection Stability
- Ryder Warehouse Management Interface
- WM/IM imbalances
- Data Cleansing and Integrity
- Training versus Education
- Transition to Business Ownership
- Pay Attention to the Easy Stuff

Chart Courtesy of John Ferney, Raytheon Airc

Issues

- Data Collection Stability
- Ryder Warehouse Management Interface
- WM/IM imbalances
- Data Cleansing and Integrity
- Training versus Education
- Transition to Business Ownership
- Pay Attention to the Easy Stuff

Chart Courtesy of John Ferney, Raytheon Aircr

"The ERP Future"

- Remote service facilities
- APO: demand planning and global ATP
- Global ATP with APO integrated to sales
- Business information warehouse
- Customer relationship management
- mySAP.com
- B2B procurement

"The go-live is not the end of the journey, but the beginning"

- Optimization

Chart Courtesy of John Ferney, Raytheon Airc

Key Take Aways

- Approach was sound - ASAP !
- Process is bigger than the software
- Data is the cornerstone
- Our R/3 configuration is solid
- Education on MRP II skills is critical
- Legacy process bottlenecks did not disappear wit
- Post “go-live” support teams for users
  - Master data
  - Education

Chart Courtesy of John Ferney, Raytheon Airc

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- Some Major ERP Implementation and Architectural Is
- Example of Rapid Implementation
- → The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommenda

Some charts courtesy of SAP America, Inc

The Internet *Changed* Everything

The Internet has ***changed the way we do business***

- **Expanded market opportunities**
- **Improved business process efficiencies**
- **New ways to retain customers**

OVERALL INTERNET OBSERVATIONS

- **The Internet is a fact of life, and will replace / cannibalize some of the "traditional" communication tools - It may turn business models up-side down, allowing new companies to globally compete in low-cost, non-traditional ways**
- **The Internet brings on additional opportunities - and challenges - to today's business managers - it does not replace all existing opportunities and/ or challenges**
- **Especially in the A&D industry, the "future" Internet Business Solutions will be subjected to "traditional" requirements (e.g. serial numbers, certifications, tracking, etc)**
- **In order to harvest the Internet opportunities, the overall business application platform (i.e. "master system") needs to respond at network speed**

➔ **Common standards, integrated and auditable data sources and real-time systems as pre-requisite for eBusiness**

e-Business: Collaboration and Personalization

Unleashing Intangible Sources of Value

c-Business: Value creation across company boundaries by dynamically connecting ppeople and applications in all aspects of business.

The Vision of Collaborative Business

Everyone Shares Information

Customers, employees, suppliers and business partners working together as one successful entity.

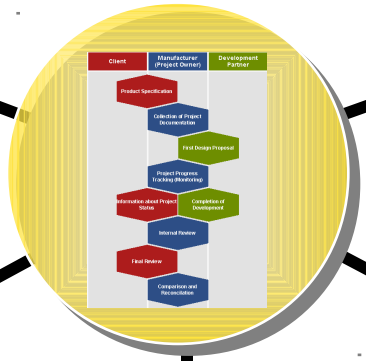
Personal, Collaborative Solutions on Demand

- **Marketplaces**
  Collaboration hubs
- **Workplaces**
  Portals for personalized, universal, role-based access
- **e-Business Applications**
  e-Commerce, CRM, SCM, Business Intelligence, Logistics, Financials, Human Resources
- **Application Hosting**
  Throughout the solution life cycle

Vision of transactional coverage

Buyers

Sellers



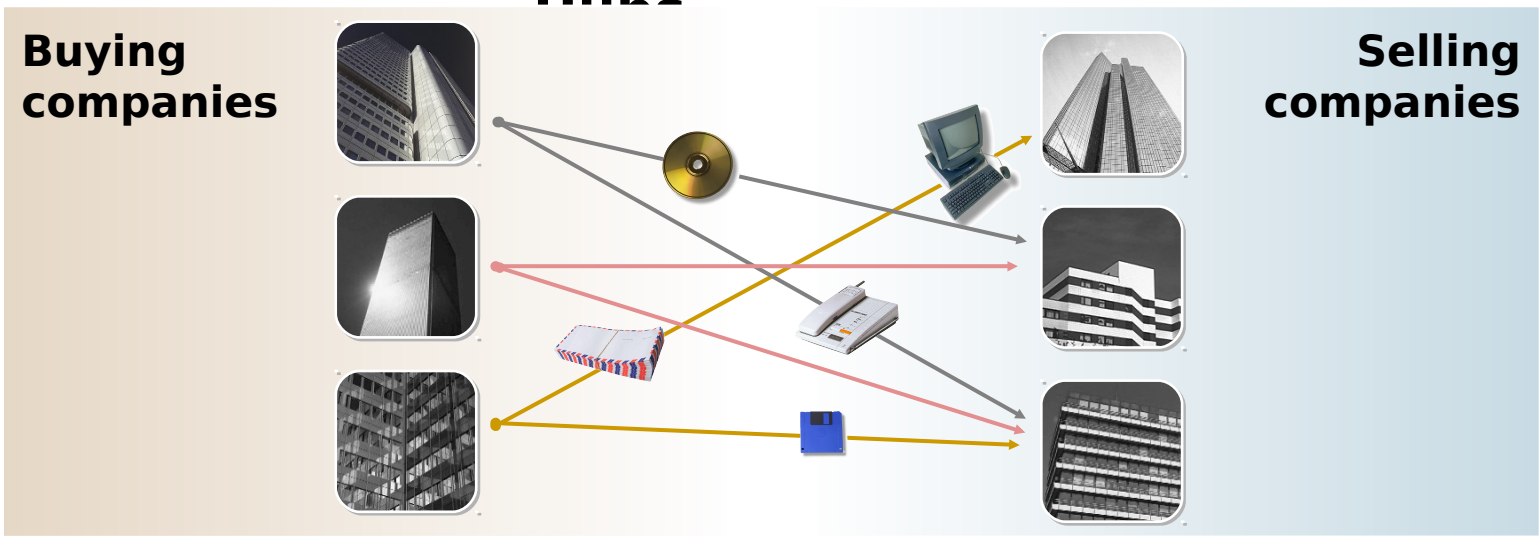
Banks

Authorities

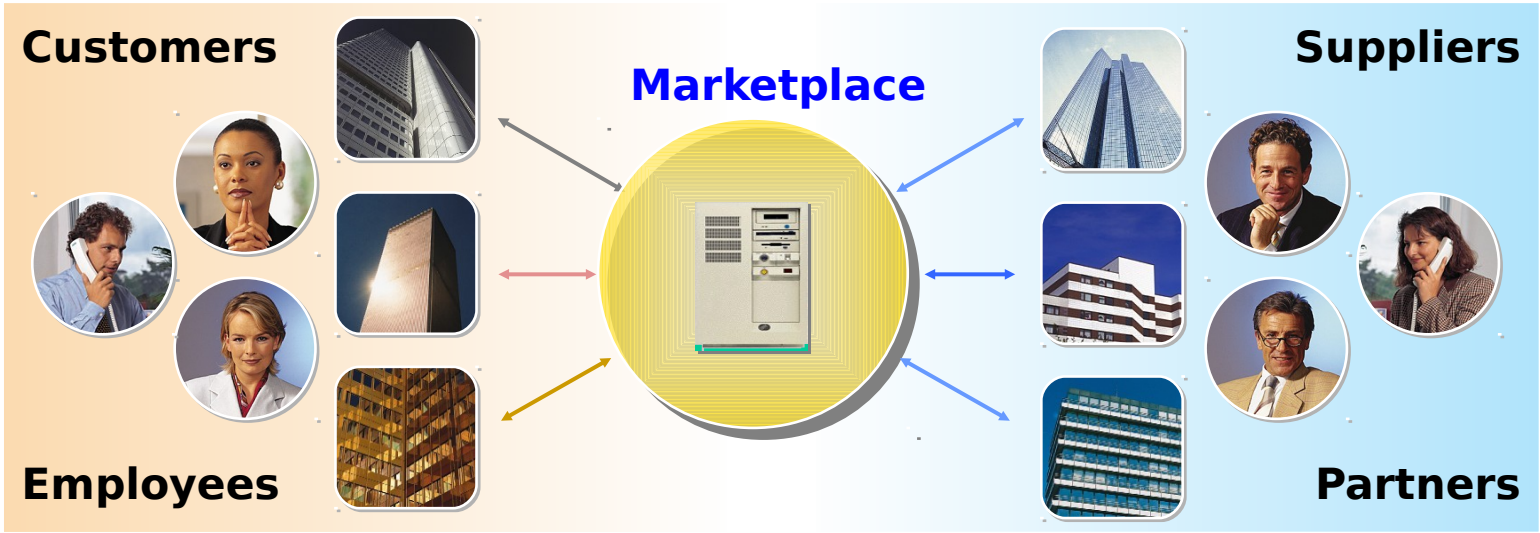
Logistics providers

Electronic Marketplaces / Portals / Internet Hubs

Old World



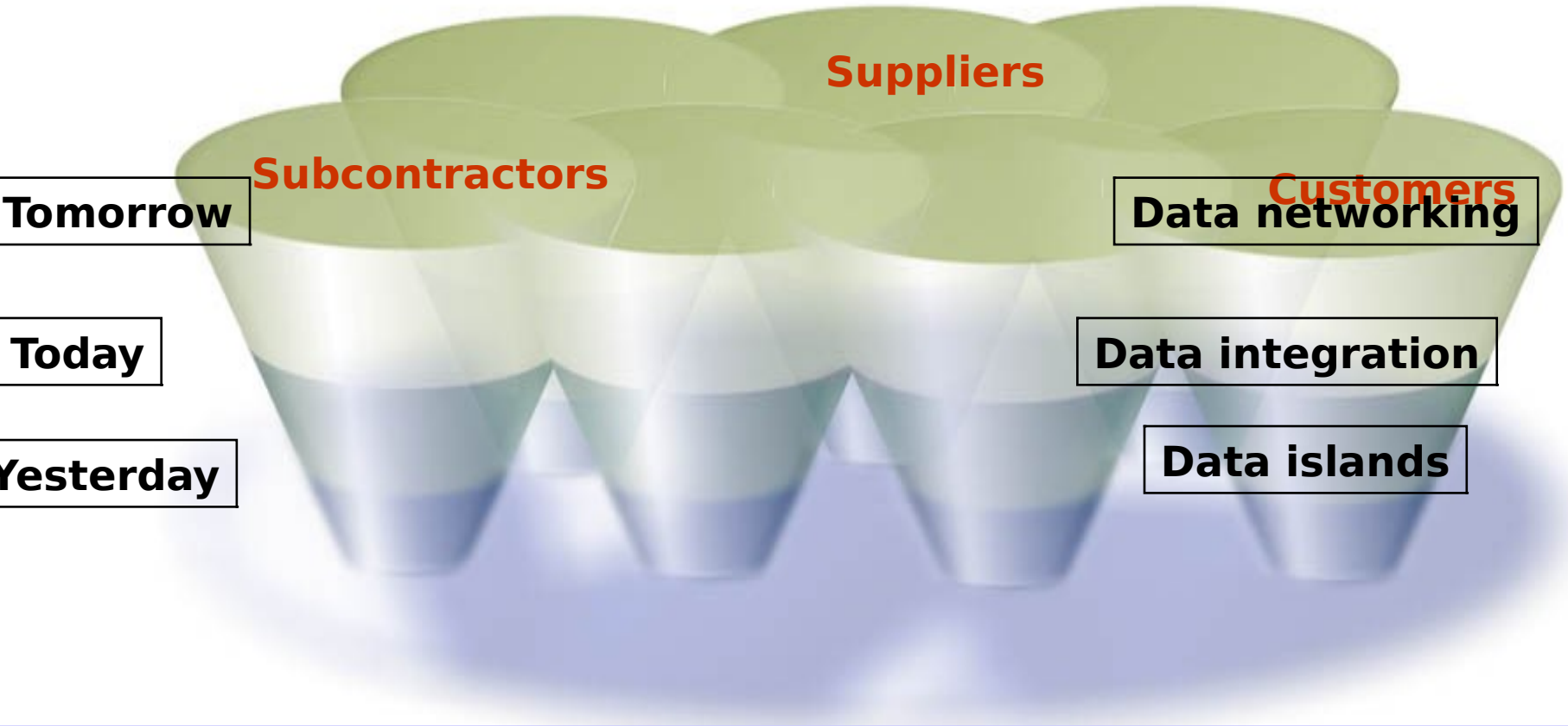
New World



Why Marketplaces?

- **Buyers like**
  - **30-70% reduction of transaction costs**
  - **5-10% cost reduction by avoiding maverick buying**
  - **3-5% lower prices for aggregated goods**
  - **10-20% lower prices for auctioned goods**
- **Sellers like**
  - **30-70% reduction of transaction costs**
  - **Up to 50% lower sales costs**
- **Market makers like**
  - **All businesses will be connected to marketplaces**
  - **New sources of revenue**
  - **Participation in other companies‘ business**
  - **Equity stakes/revenue sharing in co-owned marketplaces**

Network Excellence Is Joining Corporate Fitness

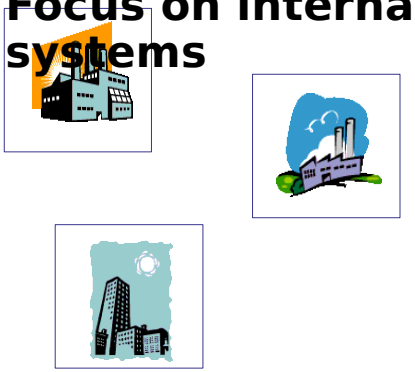


he next wave of corporate benefits will be derived from interfac optimization and re-design within the supply network

Evolution of Business Solutions

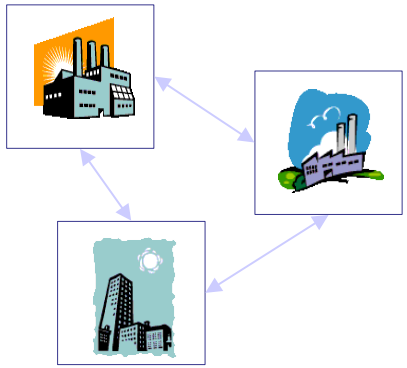
Enterprise Resource Planning

- Objectives
  - Cost and Efficiency
  - Automation
  - Best-Practice Business Processes
- Integration of business processes
- Process-orientation
- Focus on internal systems



Inter-Enterprise Cooperation

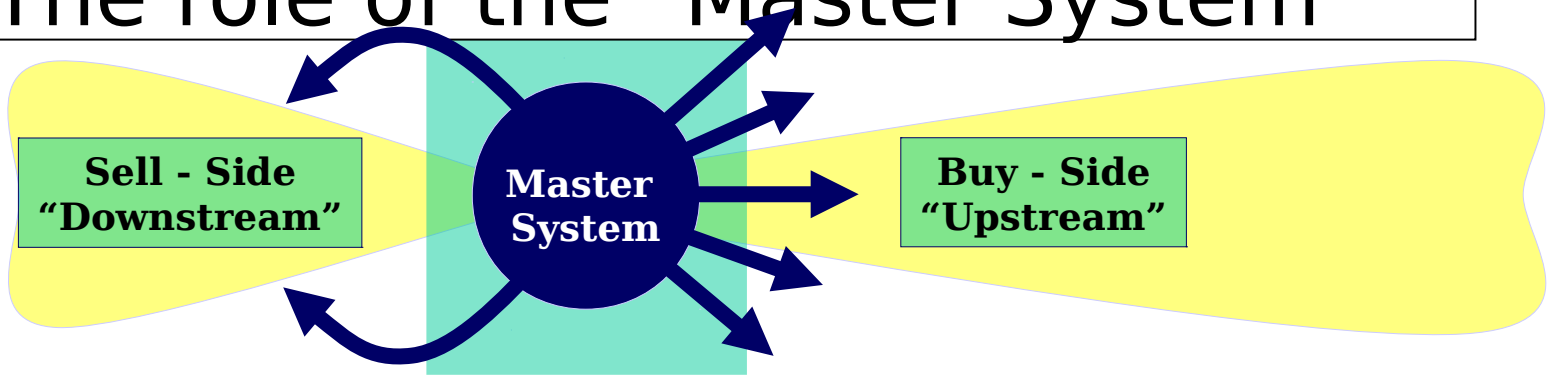
- Objectives
  - Cost and Efficiency
  - Optimization
  - Supply Chain Excellence
- Cooperation across enterprises
- Process-orientation
- Focus on point-to-point linking



Business Collaboration

- Objectives
  - Create Value
  - Flexibility
  - Customer Relationship Management
- Collaboration within business communities
- User-orientation
- Focus on the Internet hub

The role of the "Master System"



Sell Side

- Able to transact via Marketplaces, but ...
- Counteracting the aggregating effects of Marketplaces
- Customer Relationship Management Mechanisms
- Value Added Services
- Supply Chain Mngmt / Inventories / Forecasting
  - Documents

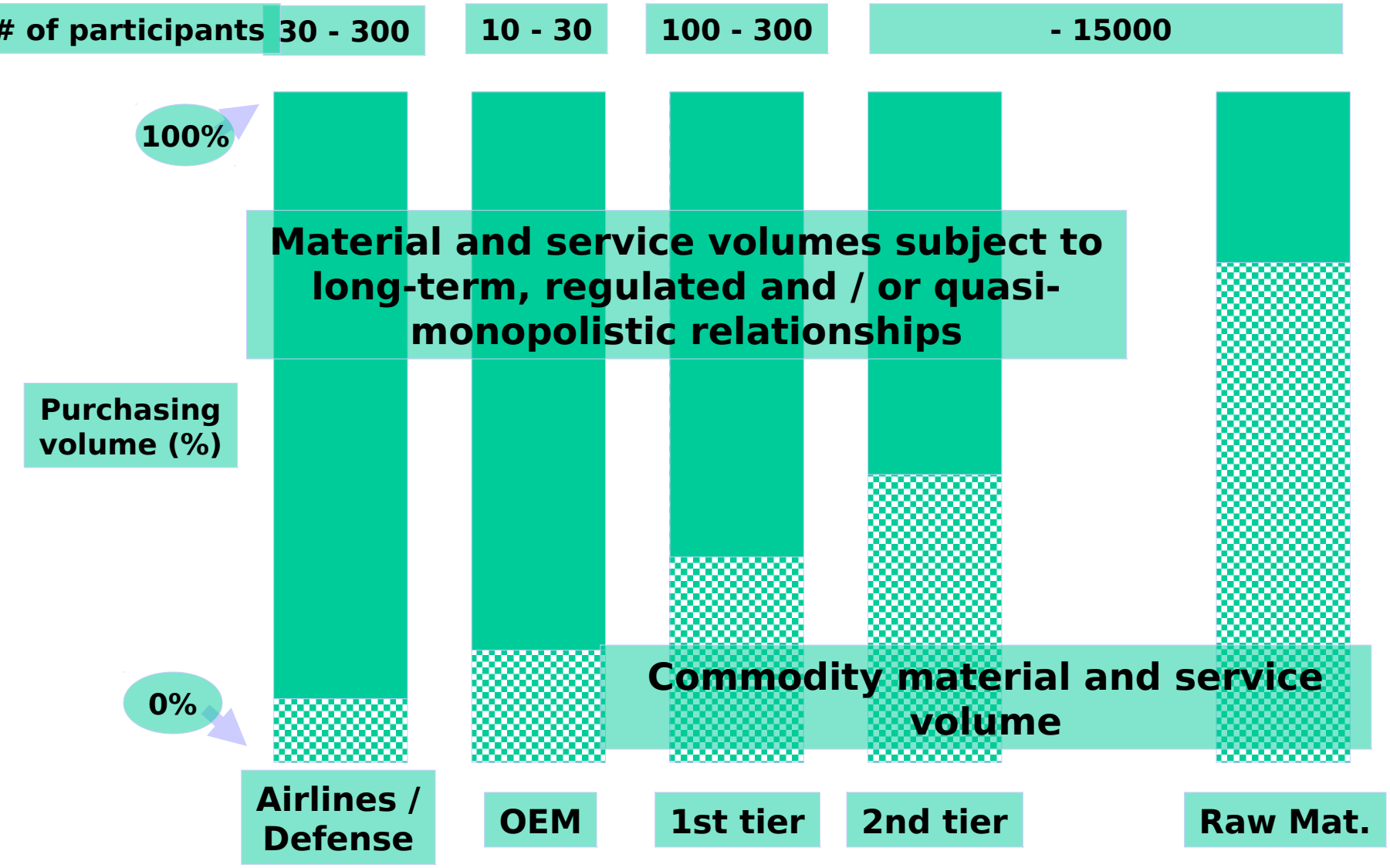
Master System

- Maintaining Master Data
  - Product Availability Data
  - Engineering Data
  - Program Management
  - Costing Data
  - Audit trails / traceability
- Responding @ Internet speed (i.e real time)
- Integrated data is pre-requisite for eBusiness efficiency

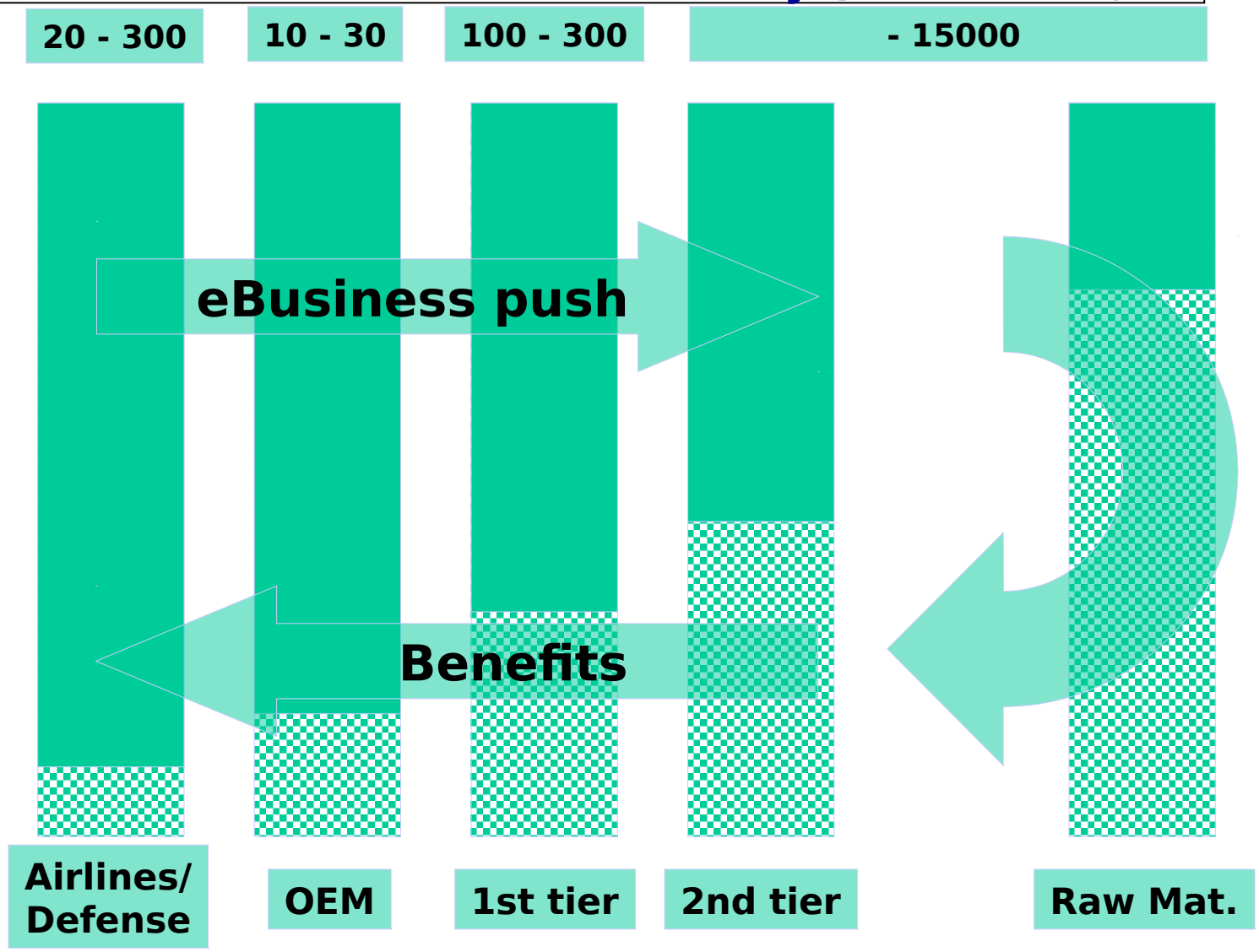
Buy Side

- Able to transact via multiple Marketplaces, and ...
- Benefiting from Aggregation / Comparison / Increased competition
- Utilizing common standards, benefit from any value adding services provided by the supplier

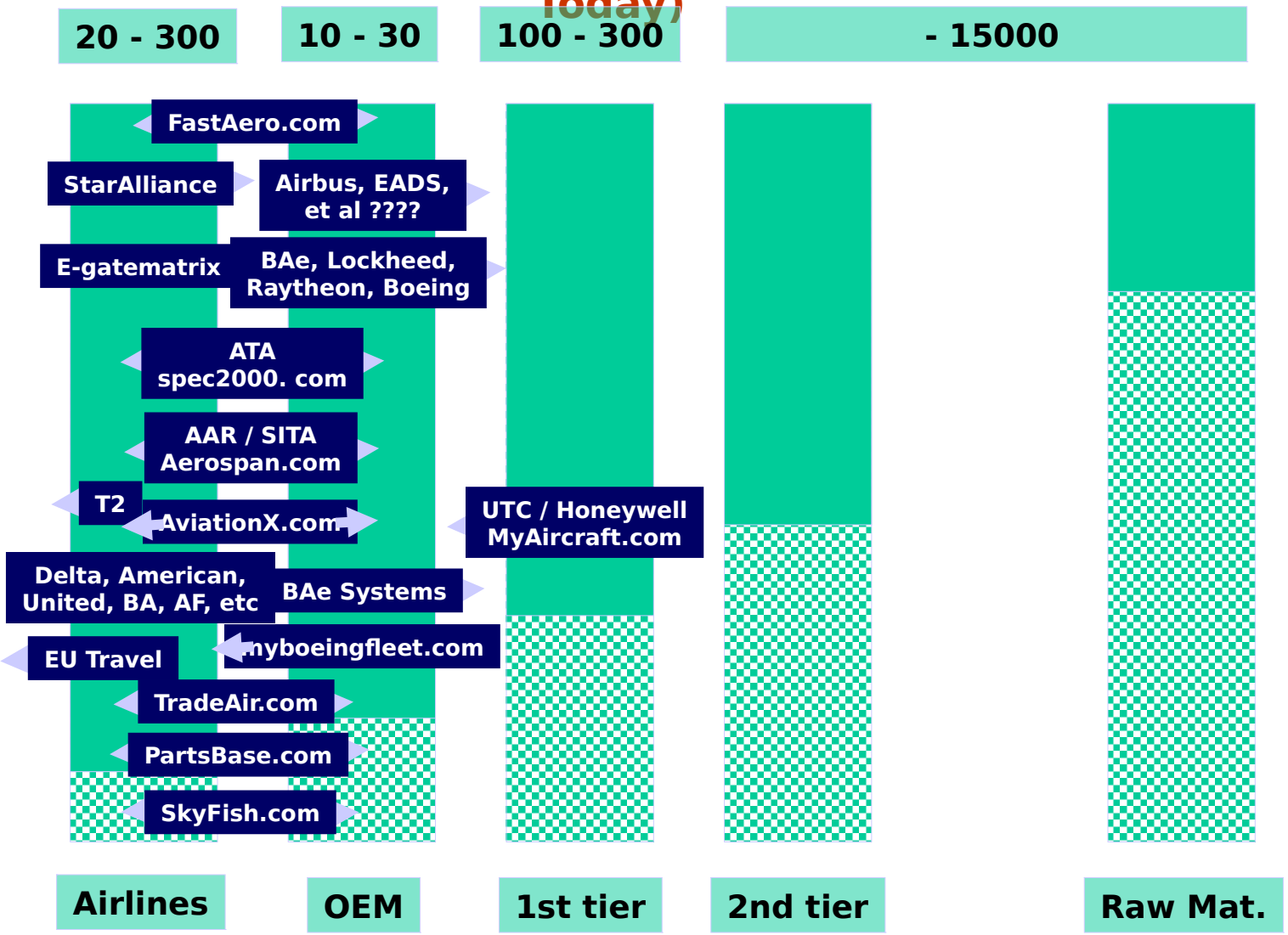
The structure of the A&D Industry



The structure of the A&D Industry (Continued)



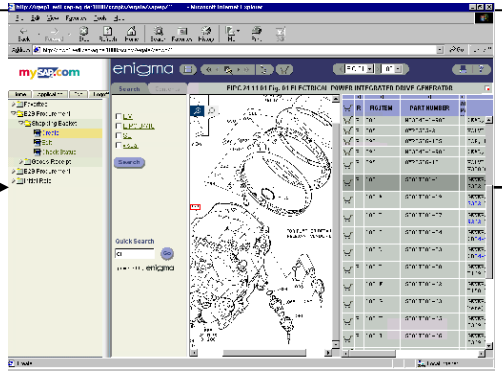
The structure of the A&D Industry (What is Going on Today)



Source: Flight International 23 - 29 May 2000 - list is not comprehensive

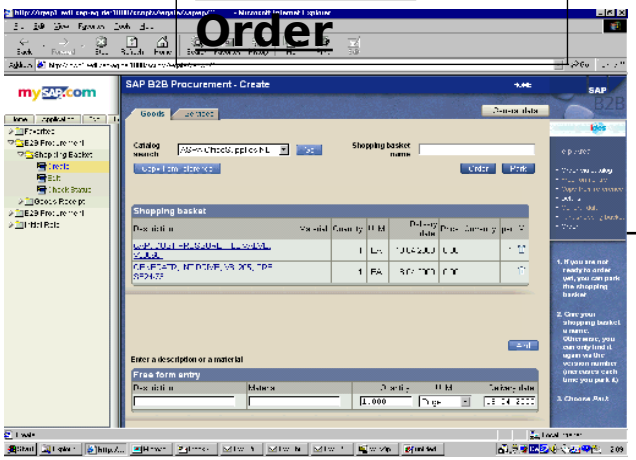
An Example: Using B2B for Parts Provisioning

Mechanic searches/verifies part number in eIPC

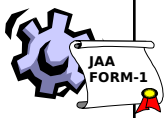


Part numbers posted to
B2B shopping basket
Purchase Request

Material Planner checks parts availability
Purchase Order



Availability?



check part availability

Availability report

ERP IN THE AEROSPACEAND DEFENSE

AN EXAMPLE OF A MAJOR NEW INTERNET B2B INITIATIVE:

A NEW GLOBAL TRADING EXCHAGE FOR THE AEROSPACE AND DEFENSE INDUSTRY *

- **Farnborough, July 25, 2000 -- The four founding partners of the recently created Aerospace & Defense Global Trading Exchange today announced that they have signed a definitive agreement and are planning to launch the web-based exchange by the end of September. They also announced Exostar SM as the name of the new company.**

- **Initial partners in the Exostar SM venture include BAE SYSTEMS, The Boeing Company (NYSE: BA), Lockheed Martin Corporation (NYSE: LMT),and Raytheon Company (NYST: RTNA, RTNB).. *Other aerospace and defense suppliers and buyers around the world are invited to participate*.**

- **Exostar SM will be an independently incorporated and neutral electronic marketplace designed to increase the efficiency of supply chain transactions and improve design collaboration across the aerospace and defense industry.**

- **"We are forging a new e-commerce world for the aerospace and defense industry. The multi-national aspects of Exostar SM reflect our aspiration to create a global e-marketplace for our business."**

courtesy of George Nolan, etc, Exostar and Further Anderson

Internet Realities in Aerospace & Defense

- **Most major companies have commenced their Internet activities**
  - **Web presence**
  - **Online Stores**
  - **Business Directories**
  - **Internet enabled Customer Relationship Management applications to improve competitive advantage**
- **Most “Buying & Selling” applications in a B2B environment currently ignore the integration aspects between the accounting systems**
- **Most companies are recognizing the benefit of the Internet, yet the lack of industry standards may prevent the realization of some of the Internet dreams**
- **“Marketplaces” or “Exchanges” are being created to enable the communication within the various communities**

Implications for A&D Companies

- **The utilization of Web-enabled functionality for Internet / Intranet usage will continue, and accelerate**
- **Today´s applications allow for true interaction, beyond simple representation of the company and product range - They lack back office integration**
- **Tomorrow´s functionality will allow for genuine linkage to the enterprise based systems, enabling true "electronic handshaking"**
  - **B2B (Business to Business) and B2C (Business to Consumer) concepts**
  - **Simple "Master-slave" updating, exchanging or collaborating systems**
  - **Linkage for engineering, project and financial data**
- **Internet applications may evolve to be the Customer Relationship Management (CRM) tool for our industry**

➔ **The Internet will be a major enabler to the A&D industry in the future**

Summary - Top three Take-aways

- **The Internet is providing a new set of challenges, some of which may change the rules of business**
- **In the Internet age, the complex processes of the A&D industry still have to be mapped to software applications**
- **Beyond the simple buying and selling applications, most current Internet applications appear to be stand-alone <u>today</u>**

AGENDA

- ERP Definition
- Overall Observations
- More on ERP in the A&D Industry
- Broad Review of Programs
- Some Major ERP Implementation and Architectural Issu
- Example of Rapid Implementation
- The New Internet B2B Initiatives
- Lessons Learned and Conclusions and Recommendatio

LESSONS LEARNED (AGAIN)

Conclusions and Recommendations - 1

- *WHILE NEW TECHNOLOGY IS ADVANCING AT DIZZYING SPEED, WE SOMETIMES STILL HAVE OUR FEET MIRED IN THE MUD OF THE PAST: CULTURAL CHANGE IS THE MOST DIFFICULT OBSTACLE*

- *THE INTERNET IS HERE AND DEVELOPING - JOIN IT, BUT*
  - *DATA HAS TO BE BETTER THAN EVER*
  - *YOU STILL NEED A BACKBONE TRANSACTION SYSTEM*

LESSONS LEARNED (AGAIN)

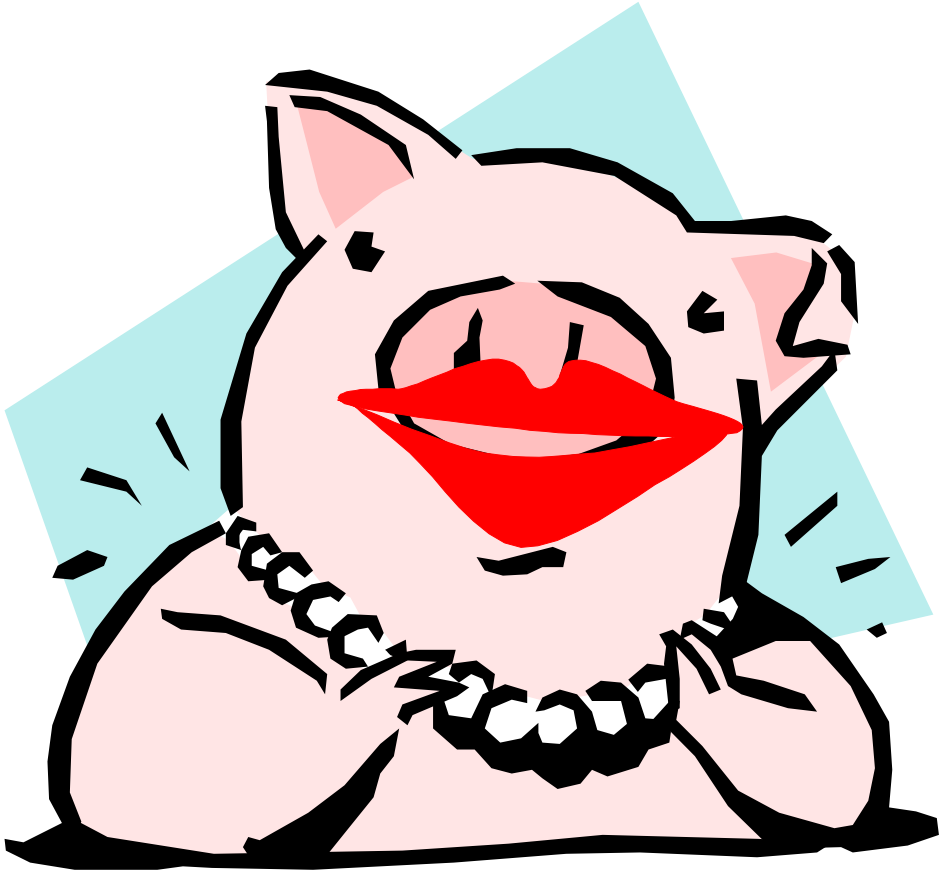
Conclusions and Recommendations - 2

- *RAPID IMPLEMENTATION OF ERP IS POSSIBLE AND MOST COST EFFECTIVE*
- *DO NOT LET LEGACY SYSTEMS OVERWHELM YOU*
- *MODERN A&D ERP SYSTEMS ARE AVAILABLE AND PROVEN*
- *TOP MANAGMENET INVOLVMENT AND COMMITMENT*
- *ONE TEAM, ONE PLAN, USERS ARE THE OWNERS*
- *DATA CLEAN-UP IS DIFFICULT AND OFTEN UNDERESTIMATED*

Consideration

Plant-Wide

Research



Adopting New Applications & Technologies Is Essential!

We are not talking about putting lipstick on a pig

We are talking about survival